

SOCIOECONOMIC IMPACT ASSESSMENT

**PROPOSED AMENDED RULE 69.3.1
STATIONARY GAS TURBINE ENGINES
BEST AVAILABLE RETROFIT CONTROL TECHNOLOGY**

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Prepared by

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EXECUTIVE SUMMARY

This report presents the socioeconomic impact assessment (SIA) for proposed amended Rule 69.3.1, Stationary Gas Turbine Engines—Best Available Retrofit Control Technology (BARCT), of the San Diego County Air Pollution Control District (District). Rule 69.3.1 regulates emissions of oxides of nitrogen (NO_x) from gas turbines with a power rating greater than 0.3 megawatts (MW), for new turbines, or 1.0 MW for existing turbines.

Proposed amendments to Rule 69.3.1, if adopted, will limit daily NO_x mass emissions from older peaking turbines (legacy peaking units) on days with forecasted high ozone levels, serving to improve air quality. Peaking turbines installed before December 16, 1998 (i.e., prior to the initial adoption of Rule 69.3.1) are subject to a less stringent NO_x concentration standard than more recently constructed peaking turbines. The proposed new limitation applies only on days for which there is an adequate supply of electrical power—i.e., on days for which the electricity supply exceeds the demand. Consequently, the resulting reduction in electricity generation from older peaking turbines can be compensated by increased electricity generation by other, lower NO_x emitting power plants in the region (subject to applicable air quality permits and permit conditions), ensuring an overall net benefit to air quality in the region.

The proposed rule amendments would also extend the maximum allowable exemption from the NO_x standards in the rule during startups for combined-cycle turbine power plant from 120 minutes to up to 360 minutes (extended startup) in certain circumstances (a cold start). This addresses technical feasibility issues of the existing 120-minute exemption for existing large combined-cycle power plants and will eliminate an unintended potential regulatory barrier for deployment of combined-cycle technologies and eventual displacement of older, less efficient, and higher NO_x emitting power plants, resulting overall in a cumulative net benefit to air quality over the long term. Increasing the startup exemption period for cold starts would allow additional emissions during these infrequent, transitory periods. However, the District has concluded that the emission increase is not significant and likely offset by reductions in emissions from other power plants, especially over the long-term.

Finally, the proposed rule amendments would provide an exemption from the NO_x concentration standards during limited periods of low-load operation—not exceeding 130 minutes per day and 780 minutes per year—for all turbines that use lean premix NO_x combustors. This exemption is designed to allow for diagnosis and repair of a detected turbine problem without shutting down the turbine. No emission increase is anticipated from this proposed exemption. The proposed limited exemption for low-load operation would more likely provide an emissions benefit relative to existing requirements.

INTRODUCTION

This report addresses socioeconomic impacts of the District's proposed amended rule 69.3.1, Stationary Gas Turbine Engines—BARCT. California law requires that air pollution control districts (excluding those with populations of less than 500,000 people) perform a SIA, to the extent information is available when adopting, amending, or repealing rules and regulations that will significantly affect air quality or emission limitations. This requirement does not apply to the adoption, amendment, or repeal of any rule or regulation that results in any less restrictive emissions limit if the action does not interfere with the District's adopted plan to attain ambient air quality standards or does not result in any significant increase in emissions.

The Health and Safety Code Section 40728.5 specifies the following elements to be included in the SIA:

1. The necessity of adopting, amending, or repealing the rule or regulation in order to attain State and federal ambient air quality standards.
2. The type of business, including small business, affected by the rule or regulation.
3. The range of probable costs, including costs to industry or business, including small business, of the rule or regulation.
4. The emission reduction potential of the rule or regulation.
5. The impact of the rule or regulation on employment and the economy of the region affected by the adoption of the rule or regulation.
6. The availability and cost-effectiveness of alternatives to the rule or regulation.

BACKGROUND

A. GENERAL

Rule 69.3.1 was adopted by the District in 1998 pursuant to state law requirements to limit oxides of nitrogen (NO_x) emissions, an ozone precursor, from stationary gas turbines by adopting regulations implementing BARCT for this source category. Electric generating facilities (i.e., power plants) are the only users of gas turbines subject to the rule in San Diego County.

The District is also required by State law to adopt all feasible measures to reduce ozone precursor emissions. As one such potential feasible measure, the District preliminarily determined it was feasible to reduce NO_x emissions from peaking power plants using older gas turbines (also referred to as combustion turbines) in its triennial Regional Air Quality Strategy. These plants normally tend to operate during the hottest summer days, which are often days of peak ozone concentration. Peaking turbines are used to ensure reliability of the electrical grid

and typically operate only on days of high electrical demand. Recently constructed peaking turbines have controlled emissions far below the current rule standards. However, under existing Rule 69.3.1, older peaking turbines which operate less than 877 hours per year are currently subject to a less stringent emission standard. Though these older peaking turbines do not operate for the majority of the year, the impact on air quality can be significant on the days they do operate. The proposed amendments restrict NO_x emissions from older, higher-emitting peaking turbines (legacy peaking units) on days with predicted high ambient concentrations of ozone.

Additionally, over the past decade as new turbine technologies, for example, large combined-cycle turbines, have been implemented and Rule 69.3.1 has been administered, circumstances have arisen that were not considered during initial rule development. The reduced fuel requirements (and fuel costs) and lower emissions of combined-cycle gas turbines serve as an incentive for replacing or repowering older power plants in San Diego. However, Rule 69.3.1 (as currently written) includes potentially technologically infeasible or cost prohibitive requirements for combined-cycle gas turbines during certain infrequent but unavoidable transitory operating conditions such as a cold start and low-load operation (described below). These conditions were not considered during the 1998 rule development because no combined-cycle power plants existed or were planned in the region at that time. Concerns about violating these requirements currently serve as a regulatory disincentive for deployment of modern combined-cycle power plants and a disincentive for continued operation of existing combined-cycle power plants. This impedes the replacement of older, less efficient, and higher NO_x emitting power plants. This results in a net loss in air quality for the County.

Amendments to Rule 69.3.1 are now proposed to address previously unforeseen circumstances regarding modern combined-cycle gas turbine operations and emissions controls, as discussed below.

B. TECHNICAL BACKGROUND

Gas Turbine Operating Cycles

Simple-Cycle Turbines. Simple-cycle gas turbines operate without the ability to recover heat from the turbine exhaust gases. Because there is no heat recovery equipment, simple-cycle turbines can start very rapidly and are often used as peaking turbines. The electrical power rating of existing peaking turbines in San Diego are rated at 50 MW or less.

Combined-Cycle Turbines. Combined-cycle gas turbines recover and make use of exhaust heat that would otherwise be vented to the atmosphere. Heat is captured with a heat recovery steam generator (HRSG). The HRSG creates steam that in turn drives a steam turbine to generate additional electrical energy. Because of the heat recovery, a combined-cycle gas turbine is more efficient and emits less NO_x than a simple-cycle gas turbine or a boiler/steam turbine unit (utility boiler) producing the same amount of electrical energy. Because of their efficiency, combined cycle plants are usually expected to operate nearly all the time with very infrequent (once or twice per year) shutdowns for necessary maintenance. A cogeneration gas turbine is a variant of the combined-cycle gas turbine where the recovered heat is used to provide process heat or steam for space heating or water heating.

Large combined-cycle power plants in San Diego County have an overall power rating of about 550 MW with two gas turbines rated at about 170 MW each (the remainder of the power plant's power is produced by the steam turbine system). These large combined-cycle power plants emit less than 40% of the NO_x and use about 70% of the fuel (and emit 70% of the carbon dioxide, a greenhouse gas) to generate the same amount of electricity as the region's other large power plants (utility boilers).

Turbine Emission Control Technologies

Lean Premix Combustion. One common technology used to control NO_x emissions from stationary gas turbines is lean premix combustion. Lean premix combustors operate with a large excess of air to reduce combustion temperatures and NO_x formation (the premixing is to achieve a uniform mixture of the fuel and air). If the combustion mixture is too lean (too much excess air), combustion instability or loss of combustion can occur. In addition, there are large increases in emissions of carbon monoxide (CO) and volatile organic compounds (VOCs) if the mixture is too lean. Large, modern combined cycle turbines operate near the lean limit even in normal operations to reduce NO_x as much as possible—exhaust concentrations of 9 ppmv are routinely achieved without add-on emission control systems as compared to 15 parts per million by volume (ppmv) for smaller turbines with lean premix combustion. As a result, they are more susceptible to combustion instabilities from variations in operating conditions than other turbines with lean premix combustors.

Lean premix combustion is not feasible during low-load operations such as startups, during which fuel requirements are reduced and premixing with air would yield air/fuel mixtures that are too lean, possibly causing loss of combustion and a turbine shutdown. To overcome this, turbines use some version of diffusion flame combustion to stabilize combustion at low loads. In diffusion flames, the fuel and air mix at the point of combustion resulting in near stoichiometric combustion and much higher temperatures. Consequently, turbines equipped with lean premix combustors have higher NO_x emissions during periods when the turbine operates at low loads (less than about 50% of the rated load) such as during a startup. As an example, large combined-cycle turbines, which can achieve 9 ppmv NO_x when operating above the low-load regime, have NO_x concentrations of 40 ppmv or more even with add-on postcombustion emission control systems.

Selective Catalytic Reduction. Selective catalytic reduction (SCR) is a postcombustion add-on emission control technology that further controls NO_x emissions from gas turbines by catalytically reacting NO_x in the turbine exhaust with a reducing agent, such as ammonia, to produce nitrogen and water. SCR operation may also be affected by low-load operations when turbine exhaust temperatures are reduced making the SCR catalyst less effective.

Water Injection. Water injection is a NO_x reduction technology where water or steam is injected into the gas turbine combustion zone to reduce the combustion temperature and, hence, NO_x. It is often used to reduce NO_x emissions from turbines with diffusion flame combustors. The amount of water injection and, hence, NO_x reduction is limited by the same factors that limit premix combustion—combustion instability and large increases in CO and volatile organic compounds (VOCs).

Cold Starts of Combined-Cycle Turbines

Combined-cycle gas turbines require more time to startup and reach normal steady-state operation than simple-cycle gas turbines especially during infrequent cold starts. A cold start occurs when a combined-cycle turbine has not operated for a few days (during maintenance operations, for example) and the components of the HRSG, steam turbine, and other steam system components have reached ambient temperature. During a subsequent startup, these components will heat up and expand. If they are heated too rapidly, high thermal stresses caused by large temperature variations can cause cracks and other damage to critical components—the steam turbine is particularly sensitive to rapid heating and the resulting thermal stresses. The thermal stresses increase rapidly with the size of the component so larger combined-cycle power plants require a lower heating rate than smaller plants.

To prevent or minimize such damage, the rate at which the steam system is heated during a cold start is limited to minimize temperature variations. This in turn requires the gas turbine be operated at low-load levels for an extended period of time to reduce the amount and temperature of the steam produced in the HRSG. During this period, NO_x emissions from the turbine are much higher than during normal steady-state operations because lean premix combustion is not feasible and add-on emission control systems (SCR) are not functioning at their peak efficiency.

To address this technical issue and the similar issue of low-operational periods (see below), two other large California air districts have revised their prohibitory rules for gas turbine engines to allow longer exemption periods for startups and exemptions for low-load operational periods in general (see Table 1). It should be noted that two other large California districts have not increased their startup exemption. However, in those districts their rules are constructed such that permit conditions are either used exclusively to establish startup exemptions or can override startup exemptions specified in the rule.

Table 1. Startup And Shutdown Exemption Periods in Stationary Gas Turbine Engine Rules

District	Applicable Prohibitory Rule	Startup Exemption Period	Shutdown Exemption Period	Other Exemption Periods	Date of Last Amendment	Latest EPA SIP Action Date	Remarks
Bay Area AQMD	Reg. IX, Rule 9	6 hours—cold ST ^a 4 hours—all others	2 hours		12-6-06	12-15-97 Approval	Startup exemption increased from 3 hours in 2006
Sacramento APCD	413	4 hrs—cold ST 3 hrs—warm ST 1 hr—all others	1 hour	6 hour averaging time for transitory events	3-24-05	1-10-08 Approval	Startup exemption increased from 1 hour in 2005 and transitory event exemption added
San Joaquin Valley UAPCD	4703	Unless a longer period is approved by permit, 2 hours	Unless a longer period is approved by permit, 2 hours	Unless a longer period approved by permit, 1-2 hours for transitory events	9-20-07	10-21-09 Proposed Approval	Transitory event exemption added in 2007
South Coast AQMD	N/A ^b	Addressed by permit conditions for units installed after 1989 ^b .	Addressed by permit conditions for units installed after 1989 ^b .	Addressed by permit conditions for units installed after 1989 ^b	N/A	N/A	South Coast AQMD's prohibitory rule for stationary gas turbines is only applicable to turbines existing before 8-4-89. Limits for turbines after that date are established by new source review requirements (BACT).

^aSteam turbine.

^bFor units installed prior to August 4, 1989, if not addressed by permit conditions, 15 minutes for simple-cycle units, and two hours for combined- cycle units (Rules 429 and 1134).

The period of low-load operation is much reduced during warm startups when the steam system is significantly closer to its final operating temperature. Large combined-cycle power plants in San Diego County have demonstrated the ability to achieve the NO_x standards of Rule 69.3.1 within the 120 minutes currently allowed in the rule during warm startups. It should be noted that both of the existing large combined-cycle turbine facilities in San Diego have permit conditions prohibiting having more than one of the two combined-cycle turbines at each facility in a startup mode. This reduces emissions, because the second turbine to startup in a cold start for the facility is undergoing a warm start with respect to all the steam system components, except for the second turbine's HRSG, which have been brought to operating temperature by the first turbine to startup. This allows the second turbine to achieve the rule NO_x standards within the existing 120 minutes exemption period in the rule.

Low-Load Operation

An additional infrequent occurrence of combined-cycle gas turbine operation is an unplanned, rapid load reduction. This occurs when the turbine's combustion monitoring and control system detects a possible malfunction or combustion instability that would normally lead to a turbine "trip" (an automatic protective shutdown). The turbine load is automatically reduced to prevent equipment damage and to reduce the probability of tripping while the problem is being diagnosed. The problem is often resolved during the period of reduced-load operation, thereby avoiding the time, cost, and emissions of a full shutdown and restart. Nevertheless, NO_x emissions are higher during the reduced-load period than during normal steady-state operation because, again, the gas turbine and emission control systems are not under optimal operating conditions. Although such an event is possible for any lean premix turbine, it is much more likely for a large combined-cycle turbine since they operate much closer to the lean limit of combustion and have more sophisticated control systems to detect potential problems.

Legacy Peaking Units

There are 14 legacy peaking units in San Diego County rated at 15–18 MW. Because they are peaking turbines with hours of operation limited to 877 per year or less they are subject, under the existing rule in Subsection (d)(2), to a less stringent NO_x concentration standard than other turbines rated at more than 10 MW and of comparable efficiency that are subject to Subsection (d)(1). For gas-fueled legacy peaking units the Subsection (d)(2) limit is 42 parts per million by volume (ppmv) at 15% oxygen compared to 15 ppmv if Subsection (d)(1) was applicable. Moreover, new peaking units are subject to best available control technology (BACT) requirements under new source review (NSR). BACT is currently a concentration limit of 2.5 ppmv for NO_x for a new peaking turbine (typically rated at 40 - 50 MW).

The total power output of these legacy peaking units in the County is about 220 MW. Although they are limited to less than 877 hours per year of operation by the rule and typically operate less than 200 hours per year, their impact on air quality can be significant on the days they do operate, such as hot summer days that are conducive to ozone formation and build-up. These legacy peaking turbines do not have lean premix combustion systems and are controlled solely

with water injection. The gas-fueled units achieve a NO_x exhaust concentration of about 30 ppmv on average, which is near the typical limit of 25 ppmv for water injection for newer turbines. The one turbine that only uses liquid fuel achieves an average NO_x exhaust concentration of about 40 ppmv, which is less than the Subsection (d)(1) standard of 42 ppmv (the Subsection (d)(2) standard is 65 ppmv).

Because of their age, the legacy peaking units are also inefficient using about 70% more fuel to produce the same amount of power as a new peaking turbine. As a result, even though they are relatively well controlled for units using only water injection, the gas-fueled units emit approximately 2.0 pounds of NO_x per megawatt-hour (MW-hr) of electrical energy generated. In comparison, the newest gas-fueled peaking plants emit about 0.1 pound per MW-hr, and large combined-cycle plants emit about 0.05 pound per MW-hr during normal operations.

SUMMARY OF PROPOSED AMENDMENTS TO RULE 69.3.1

To address the issues regarding potential high daily emissions from legacy peaking units, extended startup for combined-cycle turbines, operation at low-load for turbines with lean-premix combustors, and other minor issues with the rule, the following amendments to existing Rule 69.3.1 are proposed:

1. For peaking units with a power rating greater than four MW and installed prior to 1998, a specified calendar-day aggregate NO_x mass emission limit for all units under common ownership on days that an exceedance of the federal 8-hour ambient air quality standard for ozone is forecast. The daily mass emission limit begins at an intermediate level in 2012 and declines to its final level in 2015. This is in addition to the requirement in the existing rule to meet NO_x concentration limits of Subsection (d)(2), excluding periods of startup, shutdown, and fuel change. Legacy peaking units that can comply with the same standards as other units of similar power rating and efficiency that are subject to Subsection (d)(1) of the existing rule are not subject to the daily mass emission limit.
2. An exemption to the proposed new daily mass emission limit for legacy peaking units in cases when the units operation is essential to maintaining reliability of the electrical grid.
3. An amendment to Subsection (d)(2) that restricts its applicability to peaking turbines to turbines installed prior to 1998.
4. For dual-fueled legacy peaking units, a requirement that they use natural gas on days that an exceedance of the federal 8-hour ambient air quality standard for ozone is forecast. The units are exempt from this requirement if there is force majeure gas curtailment and are also exempt from the proposed new daily mass emission limit.
5. An exemption from the rule NO_x standards during extended startups of up to 360 minutes for combined-cycle turbines when conditions indicate an extended startup is necessary, as determined by the Air Pollution Control Officer. The existing rule only allows 120 minutes for a startup in all situations.

6. An exemption for periods of low-load operation for turbines using lean premix combustors and equipped with a continuous emission monitoring systems (CEMS) that records data on a minute-by-minute basis. The exemption period is limited to 130 minutes per day or 780 minutes per year. The existing rule does not contain this exemption.
7. For units subject to the rule's standards, at a minimum, annual source testing or, for units subject to the federal acid rain program, testing at a frequency consistent with that program. The existing rule requires annual source testing for all units, but allows District discretion to allow less frequent source testing.
8. New monitoring and recordkeeping requirements necessary to support the proposed daily mass emission limit and new startup and low-load operation provisions and simplifications and clarifications of other monitoring and recordkeeping provisions.
9. New definitions for major terms to support proposed new provisions and clarifications of existing definitions.
10. Updates to the test methods for determining compliance.
11. Removal of moot compliance schedule provisions.

NECESSITY OF AMENDING EXISTING RULE 69.3.1

San Diego County does not meet the National and State Ambient Air Quality Standards for ozone and is classified as an ozone nonattainment area. Since the District is in nonattainment of the State Ambient Air Quality Standards, State laws require the District to implement rules that regulate emissions of ozone precursors – VOCs and NOx. Existing Rule 69.3.1, which was initially adopted in 1998, regulates NOx emissions from stationary combustion turbine engines and fulfills the District's requirements under the State Health & Safety Code to implement BARCT.

As discussed below, the proposed amendments to the rule will help the District attain the ambient air quality standards. The amended rule will also help the District fulfill its commitment in the San Diego County Regional Air Quality Strategy to implement all feasible emission control measures as required by State law.

A. AMENDMENTS NOT REQUIRING AN SIA

Extended Startup and Low-Load Operation

The proposed amendments to Rule 69.3.1 allowing extended startups during an expected one or two cold starts per year and low-load operation are necessary because the current rule contains provisions that are technologically infeasible or prohibitively expensive for existing large

combined-cycle turbines. They also present a potential barrier to new combined cycle turbines of the highest efficiency being constructed in the region.

The eventual replacement or repowering of outdated power plants with modern combined-cycle power plants would provide air quality benefits to the region over the long-term because of the high efficiency and low emissions of combined-cycle power plants. However, existing Rule 69.3.1 currently contains requirements that are technologically infeasible or prohibitively expensive for existing, and perhaps new, combined-cycle gas turbines to achieve during infrequent but unavoidable cold starts and present potential compliance issues for both new and existing units during low-load operations. Although steady-state operation is the norm for combined-cycle gas turbines, an infrequent, extended cold start and some low-load operation is unavoidable despite best efforts regarding planning, design, and operating procedures. The necessity for these amendments and their potential impact are further discussed below.

Extended Startup for Combined-Cycle Turbines. The District examined the startup requirements for thirteen existing combined-cycle plants in California. Four of these combined-cycle plants have permit conditions allowing a duration of four hours or less for an extended startup. In some of these cases, the ability to comply with NO_x standards during a startup may rely on longer averaging times than that allowed in Rule 69.3.1 (one clock hour). The other nine plants have periods of six hours for extended startups, which is consistent with the maximum duration being proposed for Rule 69.3.1 for an extended startup.

There are two existing large combined-cycle power plants in San Diego County. One of those plants requires about five hours to achieve the rule NO_x standards for a cold start—if there are no problems. Starting in a shorter period puts unacceptable and potentially damaging thermal stresses on the steam system components. The other turbine did achieve the rule NO_x standards during its first and only commercial cold start. However, this startup placed higher than normal thermal stress on the steam system components that, while not immediately damaging, would significantly shorten the lifetime of those components if repeated during future cold starts. In addition, this turbine would not have been able to achieve the rule NO_x standards within the 120 minutes had there been any problems. In this case, the turbine would have likely shutdown before the 120 minutes had elapsed and then been restarted, with an associated increase in emissions.

The potential increased emissions from this amendment is limited by the emission standards of District Rule 69.3, Stationary Gas Turbine Engines—Reasonably Available Control Technology. These standards are less stringent (42 ppmv for gas-fueled units) than those in Rule 69.3.1 for turbines for which the proposed extended startup would be applicable (about 12 ppmv). However, the exemption from NO_x standards for all startups is limited to 120 minutes in Rule 69.3, and the District is not proposing any changes to this provision. Therefore, emissions during the proposed potential additional 240 minutes beyond the existing startup exemption period in Rule 69.3.1 are limited by the standards of Rule 69.3.

Based on an analysis of a cold start at an existing large combine-cycle facility, the District estimates that a worst-case 360-minute startup period would result in excess NO_x emissions of about 235 pounds per startup event relative to NO_x emissions allowed by the existing rule, with

a 120-minute startup exemption period. The actual excess NOx emissions during this startup were about 100 pounds.

To put 235 pounds of NOx emissions into perspective, this equates to less than one-tenth of one percent of total daily NOx emissions in the region (estimated to be 160 tons or 320,000 pounds of NOx emissions per day in San Diego County). The District conservatively estimates that there will be an average of two cold starts per year for each existing facility, which will result in a total potential annual emission increase of about 940 pounds of NOx per year and an actual increase of 400 pounds of NOx per year. This emission increase is offset by emission reductions from allowing the more efficient combined-cycle turbine to operate in place of less efficient power plants, such as utility boilers, that produce more NOx per MW-hr generated. This emission increase would be offset if the combined-cycle plants' operations reduced operations of the other large power plants in the County by less than eight hours, which is very likely. Furthermore, the District evaluated the impact of excess NOx emitted during a cold start with respect to the ambient air quality standards for nitrogen dioxide (NO₂) in the area surrounding the power plant most impacted by the proposed change. The District found that the impact of the NOx emissions from extended startups when added to the monitored background levels of NO₂ did not cause any exceedance of the State and federal 1-hour or annual ambient air quality standards for NO₂.

Since the criteria for the amount of additional time beyond the existing 120 minute startup exemption necessary to achieve compliance with the rule NOx standards varies from turbine to turbine, the District would decide the amount of additional time allowed, if any, on a case-by-case basis. Smaller combined-cycle turbines, which are somewhat less efficient than large combined-cycle turbines, may be able to meet the rule NOx standards within the existing 120 minutes of the rule. For example, combined-cycle power plants rated at less than 50 MW in San Diego County already have permit conditions limiting their startup exemption to 120 minutes or less. As technology evolves, it is likely shorter startup times will also be achievable by large combined-cycle turbines. Furthermore, if a shorter startup period is feasible for a proposed new or modified combined-cycle facility under cold start conditions then the District would require a shorter startup period as an enforceable permit condition under new source review rules, notwithstanding Rule 69.3.1 provisions.

The District also finds that it is not cost-effective to retrofit the existing large combined-cycle turbines to achieve the rule's NOx emission limits. Based on estimated actual emissions, capital costs for any new equipment would have to be less than \$17,000 to be cost-effective even at the District BACT cost-effectiveness threshold of \$9 per pound of NOx reduced. Based on cost information reviewed by the District, capital costs for modifications necessary to shorten the startup time would be several hundred thousand dollars or more.

With these considerations, the District has concluded that the proposed exemption for up to 360 minutes from the rule's NOx standards during a cold start is necessary because it is not feasible for existing large combined-cycle turbines to achieve the NOx standards within the existing 120 minute exemption. The District has also concluded that the additional emissions associated with the proposed exemption from the rule standards for combined-cycle turbines during a cold start are not significant and, furthermore, will not hinder, but in fact promote, the District's attainment

of ambient air quality standards since it will allow large, lower-emitting existing combined-cycle turbines to operate in San Diego County and not impede the construction of other large combined-cycle turbine facilities. Therefore, since this exemption relaxes an emission standard and does not significantly affect air quality, the District concludes that no SIA is required in accordance with State law.

Low Load Operation Exemption. Although this exemption is potentially applicable to any turbine equipped with a CEMS and a lean premix combustion system, the District expects that only large combined-cycle turbines will need to use the exemption, and then infrequently. Increased emissions from this exemption are also limited by Rule 69.3, which contains no such exemption. Based on an analysis of two large combined-cycle turbines' operations, the District estimates that there might be an average of about four periods of low-load operation per year that potentially would cause a turbine to exceed the NO_x concentration standards in the rule. The proposed exemption is limited to 130 minutes per day and 780 minutes per year for each turbine based on this analysis, which indicates that periods of load operation are very unlikely to exceed these levels.

For the proposed limited exemption for low-load operation, the District estimates that the worst case emission increase relative to the rule standards is about 100 pounds per event for a large combined-cycle turbine. However, the District has concluded that there likely will be no emissions increase from these events because, without the exemption, a unit would shutdown in the situations that the exemption addresses. In this case, there would be additional emissions associated with the shutdown and subsequent startup, which would likely outweigh the additional emissions from the low-load operational period. This is more likely because the periods of low-load operations examined by the District did not result in noncompliance with the rule, which indicates actual emission increases from these events will be very small.

For other turbines, which do not operate as close to the lean combustion limit as large-combined cycle turbines and do not have as sophisticated combustion monitoring systems, the District estimates that there will likely be very few, if any, low-load events. The District is only aware of one such event on other turbines, which was caused by external factors and did not result in noncompliance with the Rule 69.3.1 standards. However, the District has extended the exemption to all turbines with lean premix combustion systems and a CEMS with minute-by-minute sampling to address this rare contingency.

With these considerations, the District has concluded the limited low-load operation exemption is necessary to address technical feasibility of complying with the rule's NO_x standards for turbines with lean premix combustors because some periods of low load are unavoidable while attempting to achieve the greatest reduction in NO_x emissions. The District has also concluded that the additional emissions associated with the proposed exemption from the rule standards for turbines with lean premix combustors during limited periods of low-load operation are not significant and, furthermore, will not hinder, but in fact promote, the District's attainment of ambient air quality standards since it will eliminate a barrier to large combined-cycle turbines operations by providing compliance assurance for these turbines. Therefore, since this exemption relaxes an emission standard and does not significantly affect air quality, the District concludes that no SIA is required in accordance with State law.

Other Amendments

Legacy Peaking Unit Use of Natural Gas. A companion amendment to the new proposed daily NOx mass emission limit requires that legacy peaking units that are permitted to use natural gas or liquid fuel only use natural gas on forecasted ozone exceedance days to ensure that maximum emission reductions occur. However, the District expects no cost to industry since these units currently only use natural gas because of the expense of liquid fuels and this is not expected to change in the foreseeable future. There are no electrical reliability issues since the units are exempted if there is a force majeure gas curtailment (a curtailment beyond their control) and natural gas is not available. The units are also exempted from the proposed daily NOx mass emission limit in this case to allow adequate operating time. Since this is not a significant change in emission limitations relative to current practice and does not have a significant impact on air quality, the District concludes no further SIA is required in accordance with State law.

Restricting Applicability of Subsection (d)(2). A second companion amendment to the new proposed daily NOx mass emission limit restricts the applicability of Subsection (d)(2) for peaking turbines to turbines installed before 1998. This ensures no future peaking turbine will seek to use the less stringent limit of Subsection (d)(2) by limiting their operating hours to less than 877 hours. This is not a significant change in emission limitations since the legacy peaking units are not affected and no peaking turbine permitted since 1998 makes use of this provision. In addition, turbines with lean premix combustion systems are now readily available that comply with the more stringent NOx standards of Subsection (d)(1). Since this is not a significant change in emission limitations relative to current practice and does not have a significant impact on air quality, the District concludes no further SIA is required in accordance with state law.

Source Testing Frequency. The Environmental Protection Agency (EPA) is requiring Rule 69.3 be amended to remove District discretion for less frequent source tests than annually. The District is proposing the same amendment for Rule 69.3.1 for consistency. The District is also proposing amendments that allow units equipped with CEMS that are subject to the federal acid rain program be tested at the same frequency as required by the acid rain program. These amendments are not a change to an emission limitation and do not affect air quality, so no SIA is required.

There will only be a beneficial effect for industry as a result of these amendments since all units are now tested annually and the units subject to the acid rain program that do not operate more than 168 hours in a calendar quarter would be tested less frequently than annually. This satisfies EPA objections since there is a specified source test frequency that the District can not relax. Reducing the source test frequency for units subject to the federal acid rain program does not prevent effective determinations of compliance because all these units are equipped with a certified CEMS. The amendment also provides air quality benefits since it reduces unnecessary testing of these units and the associated emissions.

Additional Amendments. The other amendments to the rule are not significant in nature and no SIA is required.

B. AMENDMENTS REQUIRING AN SIA

Daily Mass Emission Limits for Legacy Peaking Units

The proposed mass emission limit is only applicable to turbines with a power rating more than four MW that were installed before 1998 (legacy peaking units) and, because their operations are limited to 877 hours per year or less, are subject to less stringent NO_x concentration standards in the rule than other turbines of similar size and efficiency. There are currently 14 such turbines in the County.

Although the emissions of these turbines are relatively small annually, an average of about 28 tons of NO_x per year for all of the turbines combined, emissions can be significant on some days. The peak one-day NO_x emissions for these legacy peaking units in the 2002–2007 time period was about 3.5 tons or about 2% of the total basin-wide NO_x from all sources. New peaking units would have emitted only 0.35 ton of NO_x to produce the same amount of electrical energy.

Because attainment of the ambient air quality standards is based on the number of days that the standard is exceeded, it is important to limit daily emissions of these legacy peaking units on days an ozone exceedance might occur. Therefore, it is necessary to adopt this amendment to expedite the District's attainment of State and federal ambient air quality standards for ozone. In addition, adoption of this amendment partially satisfies the requirement under State law that the District adopts all feasible measures.

The full socioeconomic impact of this proposed amendment and its associated monitoring and recordkeeping is discussed in detail below.

TYPE OF INDUSTRIES AFFECTED

Rule 69.3.1 is applicable to stationary gas turbine engines, which in San Diego County are all used to generate electrical power. The District has 49 turbines that are subject to the rule. However, the amendment limiting daily NO_x mass emissions from legacy peaking units only applies to 14 turbines. Of these, 13 are permitted to burn either natural gas or liquid fuel and are owned by a single owner (Owner A). The remaining turbine (owned by Owner B) only burns liquid fuel. All these turbines were installed in the 1960s and 1970s. The turbine owners are both wholly owned subsidiaries of large power companies that operate large power plants in San Diego County and are not considered small businesses.

EMISSION REDUCTION POTENTIAL

Based on the source test history and extensive analysis of the operations of Owner A's thirteen turbines and the source test history of Owner B's turbine, the District estimates that the daily NO_x mass emission limit will result in an average annual emission reduction of about 0.9 ton per year when it is fully implemented in 2015. However, emission reductions on a single day could

be as high as about 1.65 tons per day, or about 1% of total daily NOx emissions from all sources in the County. The total annual NOx emissions from the legacy peaking turbines is about 28 tons per year. The District estimates the cost-effectiveness of the rule to be about \$5.50 a pound based on the estimated average annual emission reductions and the probable costs to industry discussed below.

RANGE OF PROBABLE COSTS TO INDUSTRY INCLUDING SMALL BUSINESS

The District estimates the annualized probable cost for Owner A to be about \$9,500 per year. Of this, about \$8,200 is foregone profits from electrical energy generation when the turbine operations are limited by the daily NOx mass emission limit. The remainder is costs associated with establishing, and maintaining, monitoring, and recordkeeping to comply with the daily limit.

The costs for Owner B are estimated to be about \$430 per year. The costs for Owner B are low because it is expected that this turbine can comply, or nearly comply, with the emission standards in Subsection (d)(1) of the existing rule. Hence, the turbine will either not be subject to the daily emission cap or, if it is subject, will not have its operations limited significantly. It is also likely that Owner B's turbine will be decommissioned before the daily mass emission limit goes into effect in 2012.

IMPACT ON EMPLOYMENT AND THE REGIONAL ECONOMY

The proposed daily NOx mass emission limit for legacy peaking units will have no significant impact on the employment and economy of the region. The costs for the affected facilities are relatively small. In addition, the imposition of the daily NOx mass emission limit on the legacy peaking units will not affect the availability of electrical power in the region. The proposed amended rule contains provisions that exempt the legacy peaking units from the daily emission limit on days there is a potential shortage in available electrical power.

The daily emission limit is not applicable if a Stage 1, Stage 2, or State 3 electrical emergency or a transmission emergency is declared by the California Independent System Operator (CAISO) or, in some cases, if San Diego Gas & Electric finds that more power is needed locally and CAISO can not, or would not be expected to, act in a timely manner. A Stage 1 electrical emergency is usually declared by CAISO prior to Stage 2 or Stage 3 emergencies. A Stage 1 emergency is declared when CAISO's operating reserve level falls below approximately seven percent. Under a Stage 1 Emergency, CAISO continues to call for conservation, and will call for voluntary load reductions but does not activate mandatory load reductions. Stage 2 and Stage 3 electrical emergencies are declared when the operating reserve level falls below 5% and 1.5%, respectively. The exemption from the mass emission limit on these days allows the legacy peaking units to operate as much as necessary to provide power to the electrical grid and, thus, protect the electrical supply.

AVAILABILITY AND COST-EFFECTIVENESS OF ALTERNATIVES

There are no reasonably available alternatives for the proposed daily NO_x mass emission limit. Because of the low annual emissions from the legacy peaking units, retrofitting add-on emission control systems (such as SCR) or installation of low NO_x combustors are not cost-effective. The District estimates the cost-effectiveness of retrofitting these turbines with the next most cost-effective control option (SCR) is about \$120 per pound of NO_x reduced.